ARCDUST

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SUMMARY

Background

Electric arc furnaces produce nearly 50% of the approximately 100 million tons of steel manufactured annually in the United States and consume large quantities of electricity. In the course of melting this steel, which is primarily made from recycled material, about 730,000 tons of dust is produced and captured in bag houses. The Environmental Protection Agency has classified this dust as a hazardous material, and the cost of treatment and disposal is high. Most of the dust consists of iron, a non-hazardous element. If the dust could be economically recycled back to the melting furnace the amount of material in need of disposal would be reduced. This would improve the cost of operating electric furnaces in the steel industry and ultimately increase the market share of electric melting. The model documented in this report has been developed to help steel mill operators analyze the economics of dust recycling.

Electric arc furnaces (EAF), used in the production of steel from scrap metal, generate dust which is often contaminated with leachable quantities of heavy metals such as lead, cadmium, and chromium. As a result, this dust is listed by the US Environmental Protection Agency (EPA) as a hazardous waste (designated as Listed Waste K061) and therefore, must be treated or disposed of as a hazardous waste. Currently, it is estimated that over 730,000 tons of EAF dust are generated annually in the US alone. The cost of treating and properly disposing of the dust has been estimated to be $2 to $3 per ton of steel produced. This cost has a significant impact on the economics of EAF steel.

One potentially cost effective alternative available to steelmakers to manage this large waste stream, is recycling the dust to the EAF. The advantages of this alternative include a significant reduction in the cost of dust disposal and the savings due to the recovery of valuable constituents from the dust. However, this alternative requires additional handling of dust on-site and may also impact the operation of EAF. In order to better understand the effect of recycling EAF dust to the furnace on steelmaking economics, the American Iron & Steel Institute (AISI) and Bethlehem Steel Co. had earlier developed a model entitled, "ARCDUST" to estimate the incremental cost due to recycling dust by performing material and energy flows.

The objective of this project was to develop a simple, easy to use tool to assist analysts in the iron and steel industry in determining if dust recycling is an economically viable approach to apply to their overall dust management strategy. This objective was achieved through five primary tasks:

1. Documentation of the model methodology
2. Documentation of energy and material balances and cost calculations
3. Model upgrade
4. Feasibility assessment of future modifications
5. Development of a user's manual